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BIBLIOGRAPHY
OF ORGANIC ACIDS
IN HIGHER PLANTS

October 1957

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BIBLIOGRAPHY OF ORGANIC ACIDS IN HIGHER PLANTS

by
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Scientific interest in the organic acids of higher plants has prompted a search of the literature and tabulation of these acids and their occurrence, with available literature references.

Non-volatile, non-nitrogen-containing, carboxylic acids whose structure is generally accepted (44)(272) are included. Fatty acids and long chain polymers such as pectins are excluded, as are compounds which contain a sugar group as part of the molecule. Thus carboxylic sapogenins are included but saponins are not. The acids reported are those which are found in the free state or as salts, not as esters.

Plants are listed by family, genus and species. The family name follows the system given by Willis (799), as do genus and species when possible. Only spermatophyta are included.

Journal abbreviations and listings are, so far as possible, those used by Chemical Abstracts. All titles are in English.

This review covers all available publications through 1954. Only a limited number of references have been included from more recent literature.

Table I.

Naturally Occurring Organic Acids Listed in Alphabetical Order

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5,6-Dihydroxy-3-carboxy phenyl ester of gallic - See Digallic.	
3,4-Dihydroxy cinnamic - See Caffeic	
3,4-Dihydroxy hydrocinnamic - See Hydrocaffeic	
Dihydroxy maleic	27
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Glutaric 32

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Hydroxymalonic - See Tartronic

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Morolic	44
Mucic	44
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Oleanolic	45

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Oxalacetic 45

Oxalic 46

Phthalic 57

m-Phthalic - See Isophthalic

Pimaric 57

Piperonilic 58

Podocarpic 58

Protocatechuic 58

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Pyruvic 59

Quinic 59

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Saccharic 61

Saccharinic 61

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Shikimic 63

Succinic 64

Syringic 69

Tartaric 69

Tartronic 75

Tricarballylic 76

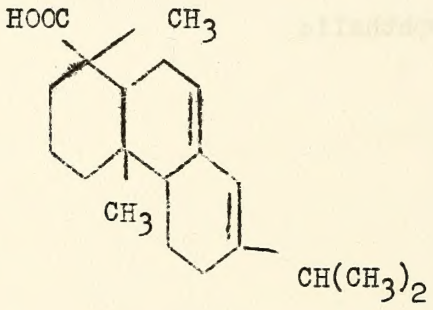
Ursolic 76

Veratric 77a

TABLE II.

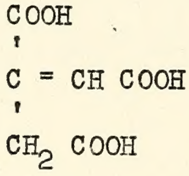
Occurrence of Organic Acids in Higher Plants

Abietic Acid



Family	Genus and Species	Source	Reference
Pinaceae		Colophony	37, 117, 166, 173
	Pinus abies	Resin	48, 422
	P. larix		422
	P. palustris	Resin	35a, 265a, 344a

Aconitic Acid



$$\begin{array}{l} COOH \\ \vert \\ C = CH\ COOH \\ \vert \\ CH_2\ COOH \end{array}$$

Chenopodiaceae	Beta vulgaris	Juice	396, 399
	" "	Unripe beet	713
Compositae	Achillea millefolium		291
	Helianthus annuus		58
Gramineae	Avena sativa		483
	Hordeum vulgare	Etiolated shoot	172
	" "	Seedling	320, 483
	Saccharum officinarum	Juice	10, 36, 50, 415, 609, 610, 611, 702, 707, 711, 794, 821, 827.
	Secale cereale		483

Family	Genus and Species	Source	Reference
	Secale cereale	Seedling	676
	Sorghum vulgare		419, 754
	" "	Scale from evap. pans	513
	" "	Juice	755, 796, 797
	Triticum sp.		481
	" "	Temporary in sprout	675
	T. sativum	Seedling	676
	Zea mays	Sprouting seed	676
Leguminosae	Phaseolus coccineus		58
Ranunculaceae	Aconitum spp.		58, 112, 504
	A. columbianum		49
	A. heterophyllum		328
	" "	Root	779
	A.napellus		50
	A. septentrionale	Tuber & root	321
	A. vernalis		504
	" "	Leaf	392
	Delphinium barbeyi		49
	D. bicolor		49
	D. consolida	Leaf sap	791
	D. culculatum		49
	D. geyeri		49
	D. glaucescens		49
	D. nelsonii		49
Solanaceae	Solanum lycopersicum	Fruit	113
	" "	Root, leaf, ripe fruit	120

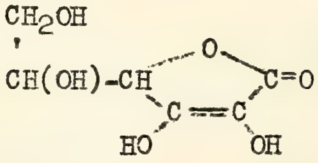
Family	Genus and Species	Source	Reference
Umbelliferae	Angelica archangelica	Root	698

Adipic Acid

$HOOC-CH_2CH_2CH_2CH_2COOH$

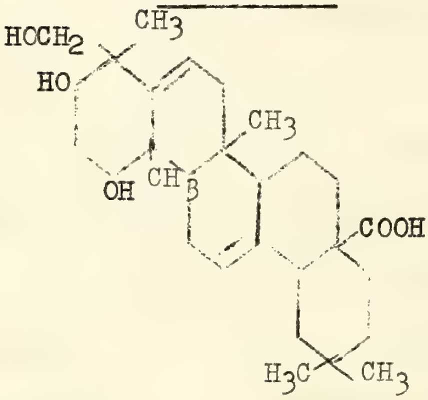
Chenopodiaceae	Beta vulgaris		400, 752

Ascorbic Acid



Since its structure was elucidated by Svirbely and Szent-Györgyi in 1932 (699) (700), ascorbic acid has been reported in almost every plant in which its presence has been investigated.

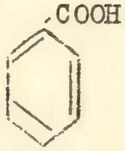
Bassic Acid



Sapotaceae	Achras sapota	Seed	282
	Bassia butyracea	Seed	282, 283
	B. latifolia	Seed	282, 283
	B. longifolia	Seed	282
	B. parkii	Seed	282, 283
	Dumoria heckelii	Seed	282
	Mimusops djave	Seed	282
	M. elengi	Seed	282
	M. hexandra	Seed	282

Family	Genus and Species	Source	Reference
	Payena lucida	Seed	

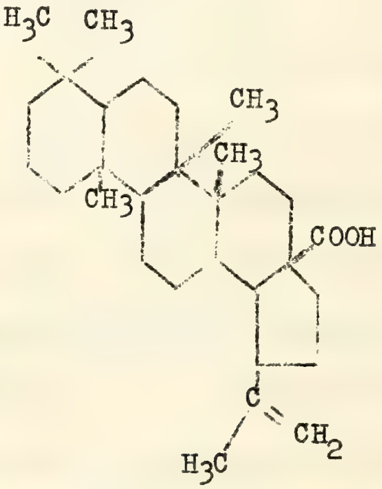
Benzoic Acid



Compositae	Dahlia sp.		517
Droseraceae	Drosera rotundifolia		806
Empetraceae	Empetrum nigrum	Leaf	312
Ericaceae	Vaccinium nacrocarpum	Berry	247, 436, 475
	V. oxycoccus	Berry	247, 418, 485, 605
	V. vitis-idaea	Berry	51, 247, 334, 385, 407, 485
Gramineae	Bambusa arundinaceae	Young shoot	226
Leguminosae	Daviesia latifolia	Leaf & stem	562
	Myroxylon pereirae	Balsam	364
	M. toluiferum	Balsam	114, 150
Lentibulariaceae	Pinguicula vulgaris	Leaf	409
Liliaceae	Dracena draco	Resin	725
	Gloriosa superba	Tuber	127
Magnoliaceae	Illicium anisatum	Fruit & Seed	505
Myrtaceae	Psidium spp.		521
Papaveraceae	Papaver somniferum		641
Pinaceae	Agathis australis		464
Rosaceae	Prunus serotina	Bark	557
	" "	Leaf	558
Rubiaceae	Coffea sp.		414, 522
Rutaceae	Casimiroa edulis	Seed	556

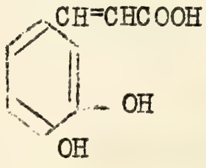
Family	Genus and Species	Source	Reference
Scrophulariaceae	Digitalis purpurea		337
Styracaceae	Styrax sp.		375, 535
	Styrax benzoin	Resin	725

Betulinic Acid



Apocynaceae	Alyxia buxifolia	Bark	22
Cornaceae	Cornus florida		612
Gentianaceae	Menyanthes trifoliata	Rhizome	679
Loranthaceae	Nuytsia floribunda	Leaves, stems, bark	22
Myrtaceae	Melaleuca-6 species	Bark	22
	Syncarpia laurifolia	Bark	586
Platanaceae	Platanus acerifolia	Bark	104
Punicaceae	Punica granatum	Leaves and bark	102
Rhamnaceae	Ziziphus vulgaris	Seeds & bark	339

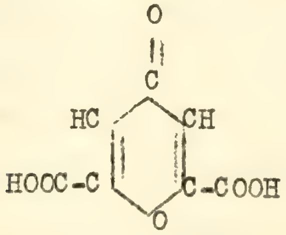
Caffeic Acid



Aquifoliaceae	Ilex aquifolium	Leaf	686

Family	Genus and Species	Source	Reference
	I. paraguayensis	Leaf	686
Compositae	Anthemis nobilis	Flower	554
	Taraxacum officinale	Root	553
Labiatae	Melissa sp.	Leaf	279
Pinaceae	Larix europaea	Resin	37
Ranunculaceae	Aconitum septentrionale		321
	Clematis vitalba	Flowering branch	740
Rosaceae	Crataegus oxyacantha	Leaf, fruit, flower	194
Rubiaceae	Cinchona cuprea	Bark	352
	Coffea sp.	Bean	194
	Coffea sp.	Leaf	686
Scrophulariaceae	Digitalis purpurea		89, 337
	Scrophularia nodosa	Root	323
Solanaceae	Solanum tuberosum		329
Umbelliferae	Angelica archangelica		698
	Conium maculatum		294

Chelidonic Acid



Amarylidaceae			692
	Agave sp.	Leaf	588
	Agave falcata	Anther, perigone	589
	Amaryllis crispa	Leaf, perigone, anther	589
	Androstemma junceum	Leaf, perigone, anther	589

Family	Genus and Species	Source	Reference
	Anigozanthos humilis	Leaf	589
	A. preissii	Anther	589
	Anoiganthus breviflorus	Pericarp	589
	Blancoa canescens	Leaf, perigone	589
	Brunsvigia angustifolia	Leaf, Flower	589
	B. josephinae	Pericarp, leaf, perigone, anther	589
	B. uitenhagensis	Flower	589
	Buphane ciliaris	Leaf, perigone, anther	589
	Carpolyza spiralis	Leaf, perigone, bulb	582
	Conostylis 12 spp		589
	Crinum capese	Leaf, perigone, pedicel	589
	C. kirkii	Leaf, perigone, pedicel	589
	C. purpurascens	Leaf, perigone, anther	589
	Cummingia tenella	Perigone	589
	Galanthus nivalis	Leaf, pedicel, anther, perigone	589
	G. plicatus	Leaf, perigone, pedicel, bulb	589
	Hessea maximiliani	Flower	589
	Hippeastrum mandoni	Leaf, perigone anther, pedicel	589
	Hypoxis juncea	Flower	589
	H. minuta	Flower, leaf	589
	H. probata	Perigone	589
	H. serrata	Perigone, leaf, anther	589

Family	Genus and Species	Source	Reference
	H. villosa	Leaf, perigone	589
	Ixiolirion montanum	Perigone, leaf, flower	589
	Lanaria plumosa	Leaf, perigone	589
	Leucojum 5 spp.		589
	Lophiola americana	Leaf, flower	589
	Lycoris aurea	Perigone, anther, pedicel, pericarp	589
	Narcissus 14 spp.		589
	Pancratium canariense	Leaf, anther	589
	Sternbergia colchiciflora	Leaf, perigone, anther, seed	589
	S. lutea	Leaf, perigone, anther	589
	Tribonanthes uniflora	Perigone	589
	Zephyranthes rosea	Perigone, leaf, anther	589
Berberidaceae	Berberis vulgaris		373
Campanulaceae	Centropogon 6 spp.		589
	Downingia pulchella		589
	Isotoma 5 spp.		589
	Laurentia 4 spp.		589
	Lobelia 25 spp.		589
	Lobelia cardinalis		373
	L. inflata		373
	L. inflata	Fruit	588
	L. syphilitica		373
	Siphocampylus 9 spp.		589
Cannaceae	Canna spp.	Root	588

Family	Genus and Species	Source	Reference
Dioscoreaceae	Discorea balcanica	Leaves, flower, pericarp	589
	D. deltoidea	Leaves, flower	589
	D. humifusa	Seed, pericarp	589
Haemodoraceae	Dilatris corymbosa	Flowers, leaves	589
	Lachenalia tinctoria	Flowers, leaves	589
	Wachendorfia paniculata	Flowers, leaves, pericarp	589
	W. thyrsiflora	Anther	589
Hippocastanaceae	Aesculus flava	Perigone, leaf	589
	A. hippocastanum		588
Liliaceae	Acanthocarpus Preissii	Pericarp, leaf	589
	Allium cirrhosum	Leaf	589
	A. flavescens	Leaf	589
	A. obliquum	Leaf	589
	A. tenuissimum	Leaf, flower	589
	Aloe minima	Leaf	589
	Androcymbium 3 spp.		589
	Anguillaria dioica	Leaf	589
	A. tenella	Leaf	589
	Anticlea sibirica	Leaf, bulb, filament	589
	Asparagus 11 spp.		589
	Asparagus officinalis		587
	Asphodelus clavatus		589
	A. damascena		589
	Bellevalia dubia	Flower	589
	Boemetra columellaris	Filament, leaf, perigone	589

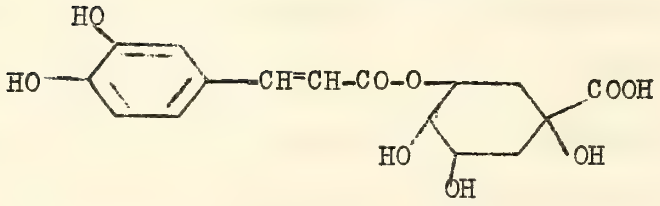
Family	Genus and Species	Source	Reference
	Borya septentrionalis	Leaf	589
	Brodiaea 3 spp.		589
	Bulbine alooides	Flower	589
	Bulbocodium ruthenicum	Leaf	589
	B. versicolor	Leaf	589
	Chlorophytum Bowkeri	Flower	589
	C. parviflorum	Pedicel	589
	Colchicum 12 spp.		589
	C. autumnale		373
	Convallaria majalis		373
	" "	Leaf, anther, perigone	589
	Cordyline Banksii	Flower	589
	C. Pumilio	Leaf	589
	Dasylirion graminifolium	Flower	589
	Dasypogon bromeliifoius	Flower	589
	Dichopogon humilis	Flower	589
	Dracena angustifolia	Leaf	589
	D. elliptica	Flower	589
	Eremurus himalaicus	Leaf	589
	Gloriosa superba		373
	Hookera hyacintha	Flower	589
	H. minor	Flower	589
	Hyacinthys leucophaeus	Flower	589
	Iphigenia diuterik	Leaf	589
	I. indica	Leaf	589
	Johnsonia lupulina	Leaf	589

Family	Genus and Species	Source	Reference
	Kniphofia 4 spp.		589
	Lachenalia montigena	Leaf	589
	L. picta	Leaf, flower	589
	Liriope graminifolia	Leaf	589
	Melanthium tenue	Leaf, perigone, seed	589
	M. virginicum	Leaf, flower	589
	Merendera 5 spp.		589
	Muscari botryoides	Flower	589
	M. calandrinianum	Flower, leaf	589
	Narthecium scardicum	Flower	589
	Ophiopogon bockianus	Leaf	589
	O. japonicus	Leaf	589
	Ornithogalum arabicum	Anther	589
	O. fimbriatum	Leaf, perigone	589
	O. narbonense	Flower	589
	O. oligophyllum	Pedicel	589
	Ornithoglossum glaucum	Leaf, flower	589
	Paradisea liliastrum	Leaf	589
	Paris bockiana	Leaf, perigone	589
	Polygonatum 4 spp.	Leaf, perigone	589
	Reineckea carnea	Leaf, pedicel	589
	Rhipogonum album	Pedicel	589
	R. scandens	Leaf, pedicel	589
	Ruscus hypoglossum	Flower	589
	Sabadilla officinarum		692
	Sandersonia aurantiaca	Leaf, perigone	589

Family	Genus and Species	Source	Reference
	Schoenocaulon officinale		373
	Scilla obtusifolia	Leaf, flower	589
	S. pratensis	Flower	589
	S. verna	Leaf	589
	Smilax 6 spp.		589
	Sugerokia orientalis	Leaf, flower, anther	589
	Tofieldia 4 spp.		589
	Trichopetalum stellatum	Flower	589
	Trillium 9 spp.		589
	Tupistra viridiflora	Leaf	589
	Urginea maritima		373
	Uvularia sessilifolia	Leaf, flower	589
	Veratrum 7 spp.		589
	V. album		373, 642, 692
	V. viride		373
	Wurmbea 4 spp.		589
	Xerotes elongata	Flower	589
	X. pauciflora	Flower	589
	X. suaveolens	Flower	589
	Yucca brevifolia	Perigone, pedicel	589
	Zygadenus 5 spp.		589
Papaveraceae	Chelidonium majus		262, 306, 373, 386, 391, 643, 692, 830
	" "	Leaf	567
	" "	Leaf, perigone, pedicel	589
	Stylophrum diphyllum	Leaf, perigone, anther	589, 638

Family	Genus and Species	Source	Reference
Rhamnaceae	Paliurus aculeatus	Pedicel	589
	Rhamnella franguloides	Leaf	589
	Rhamnus 21 spp.		589
	Rhamnus cathartica	Fruit	588
	Sageretia minutifolia	Leaf	589
	Zizyphus lotus	Leaf	589
Rubiaceae	Uragoga ipecacuanha		373
Thymelaeaceae	Daphne 9 spp.		589
	D. gnidium	Fruit	588
	Gnidia 9 spp.		589
	Passerina 5 spp.		589
	Pimelea flava	Leaf	589
	Stellera chamaejasme	Leaf, flower	589
	Thymelaea 4 spp.		589
	Wikstroemia 3 spp.		589

Chlorogenic Acid



Acanthaceae	Barleria cristata		236
	Eranthemum macrophyllum		236
	Graptobilanthes hortense		236
	Strobilanthes lupinus		236
	Thunbergia laurifolia		236

Family	Genus and Species	Source	Reference
Apocynaceae	Allamanda Hendersonii		236
	Alstonia scholaris		236
	Kopsia flavida		236, 238
Aquifoliaceae	Ilex aquifolium	Leaf, stem, root	122
	I. salicifolia		236
Araliaceae	Aralia maculata		236
	Hedera helix		257
	Heptapleurum sp.		236
	Paratropia sp.		236
	Trevesia sundaica		236
Asclepiadaceae	Hoya bandanensis		236
Bignoniaceae	Crescentia cuneifloia		236
	Kigelia pinnata		236
	Spathodea campanulata		236
Boraginaceae	Cordia suaveolens		236
	Ehretia buxifolia		236
Cannaceae	Canna indica		236
Caprifoliaceae	Lonicera sp.		236
	Sambucus javanica		236
	S. nigra	Flower	122
Chenopodiaceae	Suaeda dodeneifloia		236
Compositae	95 genera		547
	Achillea millefolium	Flower	122
	Anacyclus pyrethrum	Flower	122
	Arnica montana	Flower	122
	Centaurea jacea	Leaf	122

Family	Genus and Species	Source	Reference
	Cichorium intybus	Leaf	122
	Clibadium asperum		236
	C. surinamense		236
	Dahlia variabilis		544
	Eupatorium javanicum		236
	E. pallescens		236
	Gymnanthemum grande		236
	Helianthus sp.	Seed	240
	H. annuus	Seed	232, 237, 367, 502
	H. doronicoides	Leaf	122
	H. tuberosus		543, 544, 545
	Lactuca sativa		545
	Lappa major	Leaf	122
	Pluchea indica		236
	P. odorata		236
	Silybum marianum		543
	Stifftia chrysantha		236
	Tagetes erecta		236
	Taraxaxum gymnanthum		544
	Tithonia diversifolia		236
	Vernonia sp.		236
Convolvulaceae	Argyreia kurzei		236
	Erycibe tomentosa		236
	Ipomoea batatas		236, 545
	" "	Root	616
	Lepistemon flavescens		236
	Merremia dissecta		236

Family	Genus and Species	Source	Reference
	Porana paniculata		236
Cornaceae	Mastixia cuspidata		236
Cucurbitaceae	Coccinia cordifolia		236
	Trichosanthes sp.		236
Dipsacaceae	Dipsacus silvestris		122
Ericaceae	Vaccinium lucidum		236
Erythroxylaceae	Erythroxylum coca		236
	E. novogranatense		236
Eucommiaceae	Eucommia sp.	Leaf	255
Gesneriaceae	Aeschynanthus longiflora		236
	Agalmyla staminea		236
	Cyrtandra bicolor		236
	Episcia pulchella		236
	Gloxinia caulescens		236
	Sinningia sp.		236
Gnetaceae	Gnetum ovalifolium		236
Goodeniaceae	Scaevola sericea		236
Gramineae		Mixed herbage	305
	Bambusa sp.		236
	Oryza sativa		236
	Paspalum vaginatum		236
	Phragmites sp.		236
	Saccharum officinarum		236
Labiatae	Ballota foetida	Leaf	122
	Calamintha officinalis		122

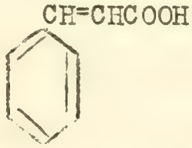
Family	Genus and Species	Source	Reference
	Mentha javanica		236
	M. rotundifolia		122
	Salvia coccinea		236
	S. pratensis		122
	Stachys lanata		122
Liliaceae	Convallaria maialis	Leaf	122
Loganiaceae	Crateriphytum moluccanum		236
	Strychnos sp.	Seed	240
	S. nux vomica		236
	" " "	Seed	735
Magnoliaceae	Michelia fuscata		236
Malvaceae	Gossypium sp.		502a
Martyniaceae	Martynia diandra		236
Moraceae	Castilloa elastica	Latex	239
	Ficus elastica	Latex	239
Oleaceae	Jasminum nudiflorum	Leaf, flower	122
Orbanchaceae	Orobanche epithymum	Stem	122
	O. rapum	Stem, flower, underground parts	122
	Phelipaea lutea		122
Pandanaceae	Freycinetia strobilacea		236
Pedaliaceae	Sesamum orientale		236
Ranunculaceae	Aconitum septentrionale		321
	Clematis paniculata		236
	C. vitalba	Leaf	122
	Ranunculus bulbosus	Leaf	122
Rosaceae	Crataegus oxyacantha	Fruit, leaf, flower	194

Family	Genus and Species	Source	Reference
	Prunus domestica	Fruit	151
	Pyrus communis	Fruit	95, 789
	" "	Leaf	798
	P. Malus	Fruit	95, 302, 467, 789
	" "	Juice	537, 538
	" "	Leaf	798
Rubiaceae	Adina cordifolia		236
	Coelospermum corymbosum		236
	Coffea sp.	Bean	194, 240, 248, 292
	C. arabica		236, 599
	C. bengalensis		236
	C. liberica		235, 236, 238
	Exostemma longiflorum		236
	Hymenodictyon sp.		236
	Mussaenda officinalis		236
	Nauclea fagifolia		236
	Oxyanthus hirsutus		236
	Palicourea gardenioides		236
	Timonius compressicaule		236
Saxifragaceae	Hydrangea mutabilis		236
Scrophulariaceae	Capraria biflora		236
	Torenia sp.		236
	Veronica alpina	Whole plant	122
	V. chamoedrys	" "	122
	V. officinalis	" "	122
	V. traversii	Root, stem, leaf	122

Family	Genus and Species	Source	Reference
Solanaceae	Atropa belladona	Leaf	546
	Brunsfelsia americana	Leaf	546
	Capsicum annuum	Leaf	546
	C. grossum	Leaf	546
	C. violaceum	Leaf	546
	Cestrum aurantiacum	Leaf	546
	C. elegans	Leaf	546
	Datura arborea	Leaf	546
	D. stramonium	Leaf	546
	Hyoscyamus albus	Leaf	546
	H. aureus	Leaf	546
	H. pusillus	Leaf	546
	H. reticulatus	Leaf	546
	Mandragora officinarum	Leaf	546
	Nicotiana sp.		351
	Petunia nyctaginiflora	Leaf	546
	Physalis alkekengi	Leaf	122
	P. angulata	Leaf	546
	P. peruviana	Leaf	546
	Physochlaena orientalis	Leaf	546
	Scopolia carnifolica	Leaf	546
	Solanum 16 spp.	Leaf	546
	S. lycopersicum		122
	S. tuberosum		327, 329, 544
	Vithania frutescens		546
	V. somnifera		546

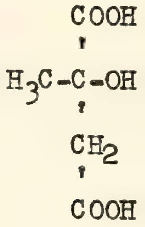
Family	Genus and Species	Source	Reference
Theaceae	Thea sinensis	Leaf	608
Tiliaceae	Corchorus olitorius		236
Umbelliferae	Angelica archangelica	Root	698
	Apium graveolens		544
	Eryngium pandanifolium		236
	Hydrocotyle sp.		236
	Thapsia garganica		544
Urticaceae	Boehmeria nivea		236
Verbenaceae	Verbena officinalis	Leaf	122

Cinnamic Acid



Family	Genus and Species	Source	Reference
Compositae	Parthenium argentatum	Aq. extract of root, rubber, resin, leaf	79, 776
Ericaceae	Enkianthus japonicus	Leaf	169
Globulariaceae	Globularia spp.		268
	G. alypum	Stalk, leaf	269
	G. vulgaris	Stalk, leaf	269, 753
Hamamelidaceae	Liquidambar sp.	Resin	299, 310
	L. orientalis	Resin	727
	L. styraciflua	Resin	311, 728
Lauraceae	Cinnamonum sp.	Leaf	368
Leguminosae	Myroxylon pereiae	Balsam	219, 273, 359, 364
	M. toluiferum	Balsam	114, 121, 150 219
Myrtaceae	Eugenia jambolana	Seed	552
Scrophulariaceae	Scrophularianodosa	Root	323
Styracaceae	Styrax liquidus	Resin	666

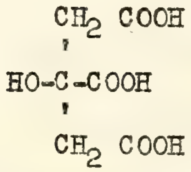
Citramalic Acid



$$\begin{array}{c} COOH \\ | \\ H_3C-C-OH \\ | \\ CH_2 \\ | \\ COOH \end{array}$$

Family	Genus and Species	Source	Reference
Rosaceae	Pyrus malus	Peel	303, 304

Citric Acid



$$\begin{array}{l} \quad CH_2\ COOH \\ \quad | \\ HO-C-COOH \\ \quad | \\ \quad CH_2\ COOH \end{array}$$

Citric acid was first found by Scheele (631) (632) in lemons and appears to be ubiquitous in higher plants. Franzen & Helwert (207) have made a critical review of the literature on occurrence of citric acid.

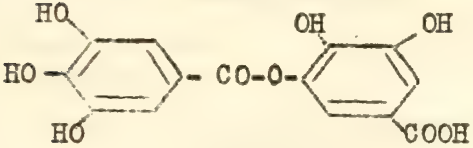
Coumaric Acid

$HOC_6H_4CH=CHCOOH$

Bignoniaceae	Catalpa bignonioides	Leaf	469
	C. ovata	Leaf, bark	288
Leguminosae	Daviesia latifolia	Leaf, stem	562
	Melilotus alba	Vegetative part	103
	" "	Root	622
	M. officinalis	Vegetative part	103
	Trifolium pratense	Flower	560
Papaveraceae	Papaver somniferum		641
Pinaceae	Pinus sp.	Resin	37
Rosaceae	Prunus serotina	Bark	557

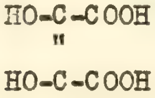
Family	Genus and Species	Source	Reference

Digallic Acid



Theaceae	Thea sinensis	Leaf	607, 608

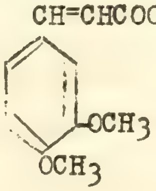
Dihydroxymaleic Acid



$$\begin{matrix} HO-C-COOH \\ \| \\ HO-C-COOH \end{matrix}$$

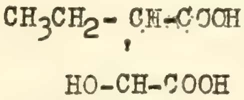
Papaveraceae	Glaucium luteum	Pressed juice	640

3,4-Dimethoxycinnamic Acid



Scrophylariaceae	Veronica virginica	Rhizome, root (leptandra)	559

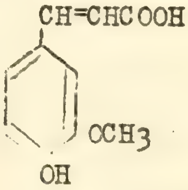
Ethylmalic Acid



$$\begin{matrix} CH_3CH_2-CH-COOH \\ | \\ HO-CH-COOH \end{matrix}$$

Euphorbiaceae	Euphorbia biglandulosa	Latex	347

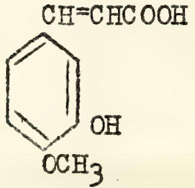
Ferulic Acid



Bignoniaceae	Catalpa ovata	Bark	288

Family	Genus and Species	Source	Reference
Pinaceae	Larix europaea	Resin	37
Umbelliferae	Ferula assafoetida	Resin of roots and rhizomes	644

Isoferulic Acid



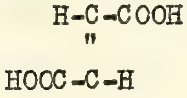
Bignoniaceae	Catalpa ovata	Root bark	288
Ranunculaceae	Cimicifuga racemosa	Rhizome	195

Fluoracetic Acid

CH_2FCOOH

Dichapetalaceae	Dichapetalum cymosum		428

Fumaric Acid

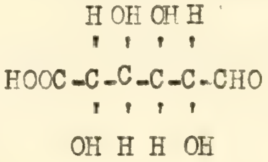


$$\begin{array}{c} H\text{-}C\text{-}COOH \\ \| \\ HOOC\text{-}C\text{-}H \end{array}$$

Aceraceae	Acer saccharum	Sirup	476
	" "	"sugar sand"	477
	" "	Sap, sirup	549
Asclepiadaceae	Asclepias syriaca	Root	430
Chenopodiaceae	Beta vulgaris	Beet diffusion juice	508, 681
Compositae	Helianthus annuus		58
Cruciferae	Bunias orientalis	Stem, leaf, flowering top	322
Eucommiaceae	Eucommia ulmoides	Leaf	254
Euphorbiaceae	Cluytia similis	Leaf, stem	739
	Ricinus communis	Germinating bean	149

Family	Genus and Species	Source	Reference
Gramineae	Hordeum vulgare	Leaf	118
	" "	Etiolated shoot	172
	" "	Seedling	320
	Oryza sativa	Grain	264
	" "	Leaf	819
	Saccharum officinarum	Juice	609, 610, 611
	Sorghum sp.	Sirup	419
Labiatae	Salvia officinalis	Leaf	100
Leguminosae	Daviesia latifolia	Leaf, stem	562
	Phaseolus coccineus		58
	P. mungo		133
Papaveraceae	Corydalis bulbosa		790
	Fumaria officinalis	Sap	142, 144, 722, 800
	Glaucium flavum	Leaf	494
	G. luteum		567, 568, 640
	Papaver somniferum		641
Solanaceae	Nicotiana sp.		661, 758, 759
Umbelliferae	Daucus carota	Root tissue	109, 110, 413
	Myrrhis odorata	Leaf	494, 314

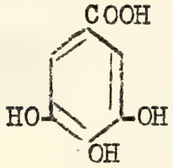
Gelacturonic Acid



$$\begin{array}{cccccc} & \mathrm{H} & \mathrm{OH} & \mathrm{OH} & \mathrm{H} & \\ & | & | & | & | & \\ \mathrm{HOOC}- & \mathrm{C}- & \mathrm{C}- & \mathrm{C}- & \mathrm{C}- & \mathrm{CHO} \\ & | & | & | & | & \\ & \mathrm{OH} & \mathrm{H} & \mathrm{H} & \mathrm{OH} & \end{array}$$

Rosaceae	Fragaria vesca	Juice	450, 451, 452
	Prunus persica	Juice	19
	" "	Fruit	20
	Pyrus comunis	Fruit	20
	P. malus	Juice	537

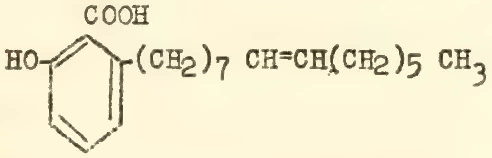
Gallic Acid



Family	Genus and Species	Source	Reference
Anacardiaceae	Rhus coriaria	Stalks	389, 685
	R. glabra	Fruit	624
	R. semialata	Fruit	744
Celastraceae	Celastrus scandens	Fruit	786
Commelinaceae	Commelina agraria		600
Cornaceae	Cornus sericea	Fruit pulp	687
	C. florida	Flowers and bracts	624a
Ericaceae	Arctostaphylos uva ursi		613
	Epigaea repens		509
Euphorbiaceae	Phyllanthus distichus	Root bark	140
Fagaceae	Quercus aegilops	Acorn	685
	Q. pedunculata	Wood	445
Geraniaceae	Geranium onoli		307
	G. pratense		92
	G. zonale		94
Lauraceae	Persea gratissima	Fruit kernel	520, 521
Leguminosae	Pithecolobium saman	Bark	313
Loganiaceae	Gelsemium sempervirens	Root	295
Musaceae	Musa paradisica	Sap	267
Myrtaceae	Psidium spp.		521
Nymphaeaceae	Brasenia schreberi		468
Oleaceae	Olea europea	Leaves	119
Polygonaceae	Rheum austriacum	Root	280
	R. rhaponticum	Root	280

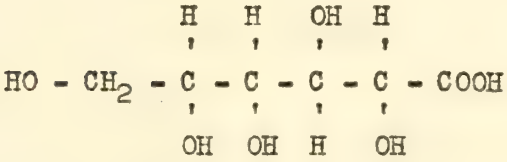
Family	Genus and Species	Source	Reference
Punicaceae	Punica granatum	Root bark	454
Rubiaceae	Coffea sp.		536
Sapotaceae	Mimusops sp.		521
Scrophulariaceae	Digitalis sp.		470
	D. purpurea		274
Simarubaceae	Quassia simaruba	Root bark	457
Solanaceae	Nicotiana tabacum	Leaf	360
Theaceae	Thea sinensis		372, 607, 608

Ginkgolic Acid



Ginkgoaceae	Ginkgo biloba	Fruit	340

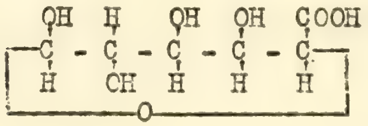
Gluconic Acid



$$HO-CH_2-\underset{OH}{\overset{H}{C}}-\underset{OH}{\overset{H}{C}}-\underset{H}{\overset{OH}{C}}-\underset{OH}{\overset{H}{C}}-COOH$$

Chenopodiaceae	Beta vulgaris	Crust on juice preheater	406

Glucuronic Acid



Compositae	Taraxacum officinale	Young leaf	510
Cucurbitaceae	Cucurbita pepo	Seed	510
Gramineae	Hordeum vulgare	Germinating Seed	510
	Musa sp.	Shoot	626

Family	Genus and Species	Source	Reference
Leguminosae	Phaseolus or vicia	Germinating seed, etiolated leaf	510

Glutaric Acid

$HOOC-CH_2-CH_2-CH_2-COOH$

Chenopodiaceae	Beta vulgaris	Beet	398, 400, 752

Glyceric Acid

$CH_2OH-CH(OH)-COOH$

Chenopodiaceae	Beta vulgaris	Diffusion juice	681
Gramineae	Hordeum vulgare		56
	" "	Leaf	57, 118
Leguminosae	Glycine sp.	Leaf	25
Solanaceae	Nicotiana tabacum		695

Glycolic Acid

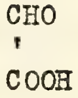
$HO-CH_2-COOH$

Caprifoliaceae	Sambucus niger	Leaf	35
Caryophyllaceae	Herniaria glabra	Leaf	35
Chenopodiaceae	Beta vulgaris	Beet juice	400, 508, 680, 681
Combretaceae	Combretum micranthum	Leaf	35
Compositae	Cynara scolymus	Leaf	35
	Solidago virgaaurea	Flowering twig	35
Dichapetalaceae	Dichapetalum cymosum		428
Ericaceae	Arbutus unedo	Leaf	35
	Erica multiflora	Flowering twig	35
Euphorbiaceae	Ricinus communis		65, 149

Family	Genus and Species	Source	Reference
Gramineae	Agropyron repens	Root and/or rhizome	35
	Avena sativa	Seedling	297
	Hordeum vulgare		56, 57
	" "	Leaf	118, 695
	" "	Etiolated shoot	172
	" "	Seedling	297
	Saccharum officinarum	Juice	566, 609, 610, 611, 662, 794
	Zea mays	Stigmata	35
Labiatae	Lavandula vera	Flowering twig	35
	Orthosiphon stamineus	Leaf	35
	Rosmarinus spp.	Flowering twig	35
Leguminosae	Lupinus albus	Seedling	297
	Medicago sativa	Sap	191
	Pisum sativum	Seedling	297
Liliaceae	Asparagus spp.	Root and/or rhizome	35
	Ruscus aculeatus	Root and/or rhizome	35
Pinaceae	Juniperus communis	Berry	35
Rosaceae	Prunus cerasus	Peduncle	35
	Pyrus communis	Juice	598
	P. malus	Juice	708
Solanaceae	Nicotiana tabacum		694
	" "	Leaf	695
	Physalis akekengi	Berry	35
	Solanum lycopersicum	Leaf	694, 695
Umbelliferae	Apium graveolens	Root and/or rhizome	35

Family	Genus and Species	Source	Reference
	Eryngium campestre	Root and/or rhizome	35
	Foeniculum vulgare	Root and/or rhizome	35
	Petroselinum sativum	Root and/or rhizome	35
Urticaceae	Parietaria spp.	Leaf	35
Vitaceae	Ampelopsis nederacea	Leaf	243
	Vitis vinifera	Unripe fruit	105, 187, 188
	" "	Fruit	286

Glyoxalic Acid

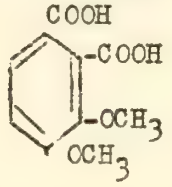


$$\begin{array}{c} CHO \\ | \\ COOH \end{array}$$

Chenopodiaceae	Beta vulgaris		400
Cornaceae	Cornus mas	Fruit	637
Ericaceae	Vaccinium oxycoccus		690
Gramineae	Saccharum officinarum	Juice	794
Labiatae	Mentha piperita	Leaf	717, 719
Leguminosae	Arachis hypogaea	Seedling	202, 203
Liliaceae	Tulipa gesneriana		717, 718
Polygonaceae	Rheum officinale		106
Rosaceae	Prunus domestica	Unripe fruit	106
	Pyrus malus	Unripe fruit	106
	" "	Fruit	303
Saxifragaceae	Ribes sp.	Unripe fruit	106
	R. grossularia	Unripe fruit	106
Solanaceae	Solanum tuberosum	Tuber	719
Umbelliferae	Daucus carota	Leaf, root	717
	" "	Root	719

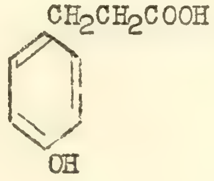
Family	Genus and Species	Source	Reference
Vitaceae	Vitis vinifera		106, 107, 256, 286
	" "	Juice	653

Hemipinic Acid



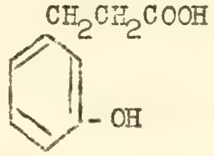
Papaveraceae	Papaver somniferum		641

Hydrocaffeic Acid



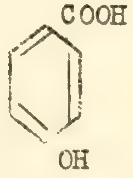
Chenopodiaceae	Beta vulgaris	Leaf	401
Solanaceae	Solanum tuberosum	Tuber	593
Vitaceae	Ampelopsis hederacea		593

Hydrocoumaric Acid

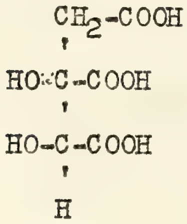
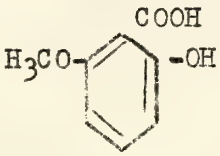
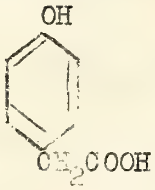
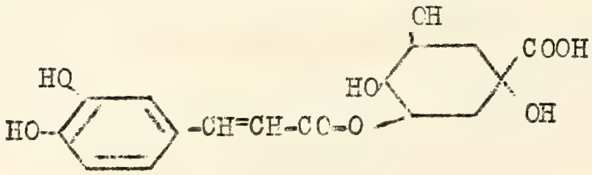


Leguminosae	Melilotus officinalis		832

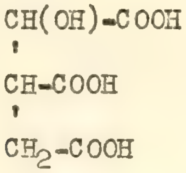
p-Hydroxybenzoic Acid



Bignoniaceae	Bignonia catalpa	Unripe fruit	541
	Catalpa ovata	Leaf	469
Papaveraceae	Papaver somniferum		641

Family	Genus and Species	Source	Reference
	Hydroxycitric Acid		
	 $\begin{array}{l} CH_2-COOH \\ \ \ \mid \\ HO-C-COOH \\ \ \ \mid \\ HO-C-COOH \\ \ \ \mid \\ \ \ H \end{array}$		
Chenopodiaceae	Beta vulgaris	Juice	399
	α-Hydroxyglutaric Acid		
	$HOOC-CH_2CH_2CHOH-COOH$		
Chenopodiaceae	Beta vulgaris	Sap	398
	2-Hydroxy-6-Methoxy Benzoic Acid		
			
Liliaceae	Gloriosa superba	Tubers	127
	p-Hydroxyphenylacetic Acid		
			
Compositae	Taraxacum officinale	Root	553
	Isochlorogenic Acid		
			
Rosaceae	Pyrus communis	Leaf and shoot	95
	" "	Leaf	798
Rubiaceae	Coffea sp.		41

Isocitric Acid

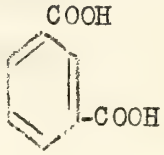


$$\begin{array}{l} CH(OH)\text{-}COOH \\ | \\ CH\text{-}COOH \\ | \\ CH_2\text{-}COOH \end{array}$$

Family	Genus and Species	Source	Reference
Anonaceae	Anona muricata		479
Crassulaceae	Bryophyllum sp.	Leaf	511, 579, 81
	B. calycinum	Leaf	113, 365, 570, 571, 574, 575, 694, 695 748, 757
	" "	Leaf and stem	573
	Escheveria sp.	Leaf	365
	E. secunda		492, 493
	Sedum acre		493
	S. maximum		493
	S. praealtum		813
	Sempervivum tectorum		493
Gramineae	Hordeum vulgare		56
	" "	Leaf	57, 695
Lecythidaceae	Couroupita guianensis	Fruit	484
Leguminosae	Pisum sativum	Ungerminated seeds	427
Rosaceae	Pyrus malus	Fruit	109, 110
	Rubus fructicosus	Fruit	131, 473, 478
Scrophulariaceae	Digitalis purpurea		337
	" "	Leaf	365
Solanaceae	Nicotiana tabacum		694
	" "	Leaf	695
	Solanum lycopersicum	Leaf	694, 695
	S. tuberosum	Juice of tuber	130

Family	Genus and Species	Source	Reference
Umbelliferae	Daucus carota		109, 110

Isophthalic Acid



Iridaceae	Iris versicolor	Rhizome	561

α-Ketcadipic Acid

$HOOC-CH_2-CH_2-CH_2-CO-COOH$

Leguminosae	Pisum sativum	Germinating seed	763

Ketoglutaric Acid

$HOOC-CH_2-CH_2-CO-COOH$

Euphorbiaceae	Ricinis communis	Germinating seed	149
Gramineae	Hordeum vulgare	Etiolated Shoot	172
Labiatae	Mentha piperita	Leaf	717, 719
Leguminosae	Arachis hypogaea	Seedling	202,203
	Pisum sativum	Young plant	767, 769
	Trifolium pratense		766, 767
Liliaceae	Tulipa gesneriana		717, 718
Rosaceae	Pyrus malus	Fruit	303
Solanaceae	Solanum tuberosum	Tuber	38, 719
Umbelliferae	Daucus carota	Root and leaf	717
	" "	Root	719

Lactic Acid

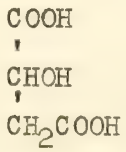
CH_3-CHOH-COOH

Family	Genus and Species	Source	Reference
Amaryllidaceae	Agave sisalana	Leaf	417, 646, 647
Bromeliaceae	Ananas sativas		521
Chenopodiaceae	Beta vulgaris		440
	" "	Juice	680, 681
	" "	Beet	688, 689
	" "	Beet and leaf	752
Compositae	Helianthus annuus		58
	Lactuca sp.		521
	" "	Leaf	646
	L. sativa	Leaf	647
Crassulaceae	Bryophyllum calycinum		811
Cruciferae	Brassica oleracea	Kale	42
	" "	Cabbage	647
Cucurbitaceae	Cucumis sativus		688
Ericaceae	Vaccinium myrtillus		331
Euphorbiaceae	Ricinis communis		141
	" "	Germinating Seed	149, 300
	" "	Seedling	646
	" "	Seedling, leaf	647
Fagaceae	Castanea vesca	Fruit	152
	Fagus sylvatica	Nut	333
Gentianaceae	Erythreae centaurium		261
Gramineae	Bambusa sp.	Shoot	626
	Hordeum distichum	Germinating Seed	689
	H. sativum		803
	H. vulgare	Etiolated shoot	172

Family	Genus and Species	Source	Reference
	Oryza spp.	Leaf	819
	Secale cereale	Leaf	676
	Triticum sativum	Leaf	676
	T. Vulgare	Germinating seed	689
	Zea mays	Germinating seed	646, 647, 803
Leguminosae	Glycine sp.		333
	Lupinus sp.	Seed	463
	L. luteus	Germinating seed	689
	Phaseolus coccineus		58
	P. vulgaris	Seedling	647
	Pisum sativum	Germinating seed	646, 647, 689
	Tamarindus indica		3, 331
	Vicia faba	Leaf, sprout	646, 647
	" "	Germinating seed	689
Malvaceae	Gossypium sp.	Seed	333
Myricaceae	Myrica rubra	Fruit	357
Myrsinaceae	Maesa picta	Seed	23
Papaveraceae	Glaucium luteum	Pressed juice	640
	Papaver somniferum	"Poppy straw"	641
Polygonaceae	Rheum sp.	Leaf	646
	R. hybridum	Tuber	647
Rosaceae	Eriobotrya japonica	Milky juice	192
	Fragaria sp.	Juice of Fruit	287
	Prunus avium		204

Family	Genus and Species	Source	Reference
	Prunus cerasus	Juice of fruit	439
	Pyrus communis	Juice of fruit	439
	" "	Juice, fruit	598
	P. malus	Fruit	206, 287
	" "	Juice of fruit	438, 439, 710
	Rubus sp.	Leaf	646
	R. fructicosus	Leaf	210, 211, 647
	R. idaeus	Leaf	217, 218, 648
Rutaceae	Citrus decumana	Juice of fruit	287
Salicaceae	Salix sp.	Bark	155
Scrophulariaceae	Digitalis purpurea		337
	Euphrasia officinalis		176
	Veronica officinalis		175
Solanaceae	Solanum dulcamara	Peduncle	809
	S. lycopersicum	Fruit	113, 120, 747
	" "	Fruit juice	601
	S. tuberosum	Tuber	39, 40, 646, 647, 688, 689, 788, 803
Sterculiaceae	Theobroma cacao	Seed	459, 460
Umbelliferae	Daucus carota		646
	" "	Root	647, 689
Vitaceae	Vitis vinifera	Juice	439
	" "	Sap	810

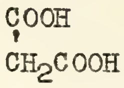
Malic Acid



$$\begin{array}{l} COOH \\ | \\ CHOH \\ | \\ CH_2COOH \end{array}$$

Malic acid was discovered by Scheele (633), who reported its presence in a number of plants. Franzen & Keyssner (212) have made a critical review of the literature on its occurrence but it appears to be ubiquitous in higher plants.

Malonic Acid

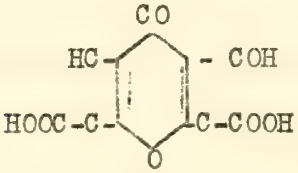


$$\begin{array}{l} COOH \\ | \\ CH_2COOH \end{array}$$

Family	Genus and Species	Source	Reference
Chenopodiaceae	Beta vulgaris	Incrustation on evaporator	397
	" "	Beet juice	399
	" "	Beet and leaf	752
Compositae	Helianthus annuus		58
	H. tuberosus		234
Cruciferae	Bunias orientalis	Stem, leaf, flowering top	322
Gramineae		Mixed herbage	305
	Avena sativa		297, 483
	Dactylis glomerata		138
	Hordeum vulgare		297, 483
	Triticum sp.		481
Leguminosae	Anthyllis sp.		58
	Astragalus sp.		58
	A. sinicus		822
	Colutea sp.		58
	Lotus sp.		58
	Lupinus sp.		58, 297
	Medicago sp.		58
	M. sativa		737
	Melilotus sp.		58
	Ononis sp.		58
	Phaseolus coccineus		58
	Sophora sp.		58

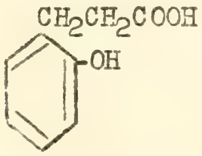
Family	Genus and Species	Source	Reference
	Thermopsis sp.		58
	Trifolium sp.		58
	Trigonella sp.		58
	Vicia sp.		58
Rosaceae	Fragaria sp.	Fruit	691
Umbelliferae	Anthriscus sp.		58
	Apium sp.		58

Meconic Acid



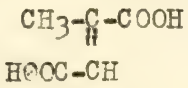
Papaveraceae	Papaver Rhoeas		516
	P. somniferum		66
	" "	Dried capsules	145
	" "	Milky sap	654, 655

Melilotic Acid



Leguminosae	Melilotus alba	Vegetative part	103
	M. officinalis	Vegetative part	103, 832
Solanaceae	Nicotiana tabacum	Leaf	360

Mesaconic Acid

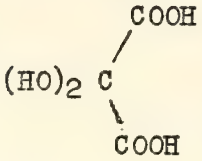


$$\begin{array}{c} CH_3-C-COOH \\ \| \\ HOOC-CH \end{array}$$

Bignoniaceae	Crescentia sp.	Curare	336
Cruciferae	Brassica oleracea	Leaf	115, 116
Gramineae	Saccharum officinarum	Juice	609, 610, 611

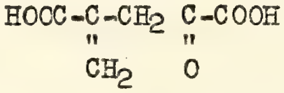
Family	Genus and Species	Source	Reference

Mesoxalic Acid



Family	Genus and Species	Source	Reference
Leguminosae	Medicago sativa		191

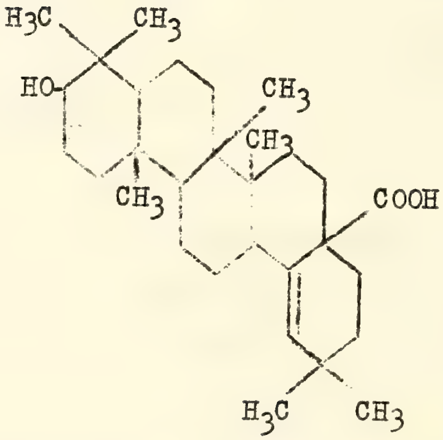
γ-Methylene-α-ketoglutaric Acid



$$\mathrm{HOOC{-}\underset{\overset{\|}{CH_2}}{C}{-}CH_2\;\underset{\overset{\|}{O}}{C}{-}COOH}$$

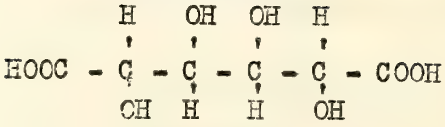
Family	Genus and Species	Source	Reference
Leguminosae	Arachis hypogaea	Seedling	202, 203
Liliaceae	Tulipa gesneriana		717, 718

Morolic Acid



Family	Genus and Species	Source	Reference
Ericaceae	Agauria salicifolia		162

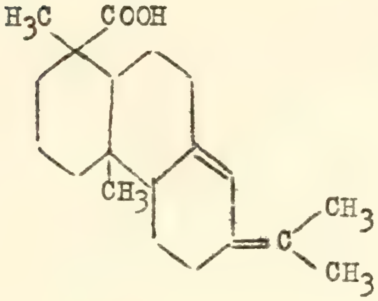
Mucic Acid



$$\mathrm{HOOC - \underset{OH}{\overset{H}{C}} - \underset{H}{\overset{OH}{C}} - \underset{H}{\overset{OH}{C}} - \underset{OH}{\overset{H}{C}} - COOH}$$

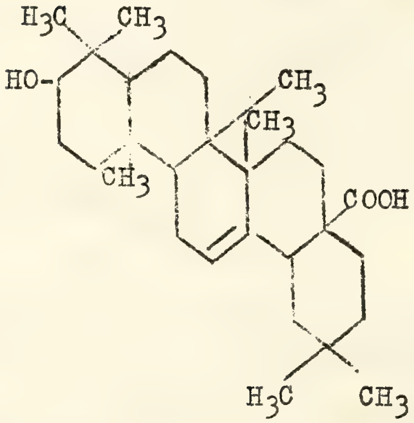
Family	Genus and Species	Source	Reference
Chenopodiaceae	Beta vulgaris	Diffusion juice	680
Elaeocarpaceae	Elaeocarpus serratus	Fruit pulp	817
Rosaceae	Prunus persica	Ripe fruit	20
	Pyrus communis	Ripe fruit	20

Neoabietic Acid



Family	Genus and Species	Source	Reference
Pinaceae	Pinus palustris	oleoresin	265a
	P. silvestris	oleoresin, wood rosin	265b

Oleanolic Acid



Family	Genus and Species	Source	Reference
Apocynaceae	Alyxia buxifolia	Bark	22
Ericaceae	Vaccinium myrtillus		590
Euphorbiaceae	Petalogstigma sericea		22
Labiatae	Thymus vulgaris		615
	Salvia officinalis		101
Loranthaceae	Viscum album	Leaf	805
Myrtaceae	Psidium guaijava	Leaf	26
Oleaceae	Olea europea	Leaf	259
Rosaceae	Crataegus oxyacantha	Leaf	60
	Eriobotrya japonica	Leaf	27
Solanaceae	Anthocercis intricata	Bark	22
	A. littorea	Bark	22
	A. odgersii	Bark	22
Vitaceae	Vitis labrusca	Pomace	434

Oxalacetic Acid

$HOOC-CH_2-CO-COOH$

Family	Genus and Species	Source	Reference
Gramineae	Hordeum vulgare		766
	Phleum pratense		766
Labiatae	Mentha piperita		717, 719

Family	Genus and Species	Source	Reference
Leguminosae	Convalia ensiformis		766
	Pisum sativum		765, 766, 767, 768, 769
	Trifolius pratense	Young leaves	764, 765, 766, 767
Liliaceae	Tulipa gesneriana		717, 718
Rosaceae	Pyrus malus	Fruit	303
Solanaceae	Solanum tuberosum	Tuber	719
Umbelliferae	Daucus carota	Root, leaf	717
	" "	Root	719

Oxalic Acid

$$\begin{array}{c}COOH\\ |\\ COOH\end{array}$$

Reviews and surveys of the occurrence of oxalic acid include Andrews and Viser (18), Esbach (189) Kohman (354), Meyen (446), Miller, Ross and Lewis (449), Molisch (455), Patschovsky (514), Schimper (636), and Treviranus (721).

Aceraceae	Acer platanoides	Root	362
	A. saccharum	Sap, sugar sand	778
Aizoaceae	Mesembryanthemum sp.		515
	M. acinaciforme		2
	M. crystallinum		17, 63
	" "	Leaf, flower	62
Amarantaceae			515
	Alternanthera sessilis		298
	Amarantus sp.		244
	A. aquatica		627
	A. caudatus	Leaf, flower	63
	" "		62
	A. gangeticus		298
	A. polygonoides		298

Family	Genus and Species	Source	Reference
Amaryllidaceae	Agave americana	Leaf	825
Anacardiaceae	Mangifera indica		87
Araceae	Acorus calamus		820
	Arum italicum	Berry	348
Aristolochiaceae	Asarum sp.		515
Balsaminaceae	Impatiens parviflora		462
	I. sultani		462
Begoniaceae	Begonia sp.		228
	B. evansiana		658, 659, 660
	B. rex		770
	B. semperflorens		129, 617, 742
Berberidaceae	Berberis vulgaris	Fruit	348
Betulaceae	Alnus sp.	Leaf	781
	Betula sp.		362
	Ostrya vulgaris		362
Bombacaceae	Adansonia digitata	Fruit	5
Bromelianceae	Bromelia pinguin	Fruit	29
Cactaceae			515
	Cereus peruvianus		738
	Opuntia sp.		486
	O. vulgaris	Stem	348
Caprifoliaceae	Sambucus nigra	Young leaf	47
	Symphoricarpus sp.	Leaf	781
Caryophyllaceae	Dianthus barbatus		500
	D. carthusianorum	Leaf, stem	13

Family	Genus and Species	Source	Reference
	Lychnis coronaria		75
	L. dioica		13, 75, 92
	L. flos-jovis		75
	L. githago		13
	Saponaria sp.		486
	S. officinalis		13
	Spergula arvensis		75
	Stellaria media		462, 500
	Tunica saxifraga		13
Celastraceae	Celastrus obscurus	Leaf	158
	Euonymus japonicus		2
Chenopodiaceae			449
	Atriplex sp.		515
	Beta vulgaris		500, 515, 540, 627
	" "	Juice	400, 447, 508, 680, 681
	" "	Root, leaf	421, 752
	" "	Leaf	34, 461, 621, 629
	" "	Swiss chard, mangold, beet leaf	630
	" "	Seed	153, 693
	" "	Root	24, 190, 234, 244, 783
	Chenopodium		515
	C. quinoa	Leaf, flower	62, 63
	Halogeton glomeratus		198, 296
	Spinacia oleracea		24,91, 189,190; 384,482,515,540.
	" "	Leaf	46,70,154,244,500, 621, 792, 820.

Family	Genus and Species	Source	Reference
Commelinaceae	Callisia repens		462
	Tradescantia		515
	T. fluminensis		53, 787
	T. selloi	Leaf	636
	T. virginica	Leaf	348
Compositae	Cichorium endivia		24, 190
	Helianthus tuberosus		234
	Kleinia articulata		318
	Lactuca spp.		521
	L. sativa		482, 540, 792
Convolvulaceae	Ipomoea aquatica		298
Cornaceae	Cornus sericea	Fruit pulp	687
Crassulaceae	Bryophyllum calycinum	Leaf	113,570,574,580, 694,695,748
	" "	Leaf, stem	573
	B. crenatum	Leaf	81, 348
	Echeveria glauca	Leaf	348
	Sedum azureum		17
	S. fabaria	Leaf	348
	Sempervivum glaucum	Leaf	52
	S. tectorum	Leaf	348
Cruciferae			515
	Brassica oleraceae		24, 190, 482
	B. pekinensis		820
	Bunias orientalis	Stem, leaf, flowering top	322
Cucurbitaceae	Cucumis melo		24, 190, 540
	Cucurbita pepo		792
Dipsacaceae	Succisa pratensis		500
Ericaceae	Vaccinium myrtillus		24, 190, 331

Family	Genus and Species	Source	Reference
Euphorbiaceae	Aleurites cordata	Leaf	229
	Euphorbia sp.		515
	Mercuralis annuelle		134
	M. perennis		500
	Phyllanthus emblica		332
	Ricinus communis		65
Fagaceae	Fagus sylvatica		98, 500, 652
	Quercus pedunculata		445
Gesneraceae	Aeschynanthus sp.		515
Globulariaceae	Globularia spp.		268
Gramineae			515
	Avena sativa	Seedling	297, 483, 530
	Bambusa sp.	Shoot	626
	Hordeum vulgare	Leaf	47, 695
	" "	Seedling	297, 320, 483,694
	Lolium perenne		423
	Oplismenus imbecillis		53
	Oryza spp.	Leaf	819
	Phyllostachys mitis	Sprout	703
	Poa pratensis		540
	Saccharum officinarum	Juice	10,86, 518, 609, 610,611,707,821
	Secale cereale		483
	Sorghum sp.	Juice	419
	S. vulgare		796, 797
	S. vulgare	Leaf	812
	Triticum sp.		481
	T. aestivum		540
	Zea mays		53, 771

Family	Genus and Species	Source	Reference
Hippocastanaceae	Aesculus hippocastanum	Young leaf	47
Hydrocharitaceae	Elodea densa		466
	E. canadensis		466
Juglandaceae	Juglans regia	Bark	356
Labiatae			515
Leguminosae	Acacia spp.	Bark	683
	Acacia cambagei	Bark and wood	682, 683
	Arachis hypogaea	Kernel	591a
	Cassia sp.	Leaf	773
	Cicer arietinum	Secretion from hairs	453
	" "	Fruit	828
	Glycine soja		540
	Lupinus albus	Seedling	297
	L. luteus	Seed	606
	Medicago sativa		540
	Mimosa speggazzinii		462
	Phaseolus limensis		540
	Pisum sativum	Seedling	297, 540, 792
	Tamarindus indica		209, 331, 332
	" "	Mature leaf	245
	Vicia sp.		324
	Vicia faba		24, 190
Liliaceae			515
	Agapanthus umbellatus	Leaf	348
	Allium cepa		8, 221, 363, 79
	Asparagus officinalis		24, 190
	Erythronium dens canis	Bulb	157

Family	Genus and Species	Source	Reference
	Hyacintha orientalis	Bulb	76
	Smilacina bifolia	Fruit	167
	S. racemosa	Fruit	167
Loranthaceae	Viscum sp.		515
Malvaceae	Gossypium sp.		184, 185, 186, 415a
Melastomaceae	Memecylon tinctorum		159
Menispermaceae	Jateorhiza columba		734
Moraceae	Cannabis sp.		134
	Ficus carica		244
Musaceae	Musa sapientum	Over-ripe fruit	490
Myricaceae	Myrica rubra	Fruit	357
Myristicaceae	Myristica surinamensis	Seed	724
Myrtaceae	Eucalyptus 12 spp.	Bark	673
	Psidium guajava	Leaf	11
Nyctaginaceae	Mirabilis sp.	Flower, fruit	542
Nymphaeaceae	Nymphaea alba	Rhizome	252
	N. lutea	Rhizome	252
Orchidaceae			515
	Vanilla planifolia		777
Oxalidaceae	Averrhoa carambola		124
	" "	Fruit	388
	" "	Juice	480
	Oxalis sp.		228, 244, 515
	O. acetosella	Leaf	348, 500
	O. corniculata		245
	O. stricta		63

Family	Genus and Species	Source	Reference
Oxalidaceae	Oxalis violacea		521
Papaveraceae			515
	Fumaria officinalis	Seed coat	246
Pedaliaceae	Sesamum indicum	Seed	266a
Phytolaccaceae	Phytolacca sp.		515
	P. dioica	Shoot, bark, pith	2
Pinaceae			614
	Pinus abies	Sap	330, 652
	P. cembra	Seedling	650
	P. excelsa	Needle	500, 823
Piperaceae	Peperomia sp.		515
Polygonaceae	Emex sp.		515
	Fagopyrum esculentum		53, 540
	" "	Leaf, stem	584
	Oxyria sp.		515
	Polygonum sp.		515
	Rheum sp.		24,108,190,244, 384,515,760,792
	" "	Leaf	684
	R. crispum	Stem	506
	R. hybridum	Leaf, rhizome	9
	" "	Leaf	572, 583, 695, 770
	" "	Stem, rhizome	618, 619
	R. leucorhizum	Stem	506
	R. nepalense	Stem	506
	R. nutans	Stem	506
	R. officinale	Leaf	106, 770
	R. palmatum	Stem	506
	R. paragon	Stem	506

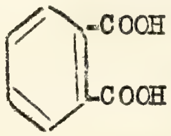
Family	Genus and Species	Source	Reference
Polygonaceae	R. rhaponticum	Stem	378
	R. undulatum	Petiole	348
	Rumex sp.		228, 244, 515
	R. acetosa	Leaf	45
	" "	Seed, root	63
	" "		61, 190, 521
	R. obtusifolius	Root	362
Polypodiaceae	Lonchitis sp.		515
Portulacaceae	Portulaca sp.		244, 515
	Talinum speciosa		298
Primulaceae			515
	Primula elatior		500
Punicaceae	Punica granatum		332
	" "	Bark	486
Pyrolaceae	Monotropa sp.		515
Ranunculaceae	Anemone sp.		515
	A. nemorosa		742
Rhamnaceae	Rhamnus lycioides	Leaf	221
	Zizyphus jujuba		332
Rosaceae	Crataegus sp.	Leaf	781
	C. oxyacantha	Leaf	47
	Fragaria sp.	Fruit	24, 190, 792
	" "		6
	Mespilus germanica	Over-ripe fruit	490
	Prunus armenica	Dried fruit	472
	P. avium	Fruit	204
	P. cerasus	Fruit	24, 343

Family	Genus and Species	Source	Reference
Rosaceae	Prunus domestica	Fruit	24, 108
	P. persica	Fruit	24, 190
	Pyrus communis	Fruit	24
	" "	Over-ripe fruit	490
	P. malus	Fruit	24, 206, 303, 736
	Quillaja		486
	Rubus sp.	Fruit	24, 792
	R. fructicosus	Leaf	211
	" "	Fruit	473
	R. idaeus		742
Rubiaceae	Cinchona spp.	Bark	592
	Coffea sp.	Seed	46
	C. arabica	Fruit capsule	277
	Dentella asiatica		298
	Galium lucidum	Leaf	348
Rutaceae	Citrus aurantium	Fruit	24, 490, 792
	" "	Leaf	668
	" "	Peel	667
	C. decumana	Fruit	332, 441
	" "	Peel	667
	C. limonum	Fruit	24, 332, 490, 792
	" "	Peel	667
	C. medica	Petiole	221
	" "	Fruit	332
	C. nobilis	Fruit	490
Santalaceae	Santalum album		315

Family	Genus and Species	Source	Reference
Saxifragaceae	Ribes grossularia		24, 108, 792
	R. rubrum		205
	R. sanguineum		361
Simarubaceae	Quassia amara	Root bark	457
Solanaceae			134
	Capsicum annuum		24, 63, 190, 244
	Datura sp.		515
	D. stramonium		462
	Nicotiana sp.	Leaf	31,501,511,576,581
	" "		582,670,758,759,81 33,694,715,716,761
	Nicotiana tabacum	Leaf	360, 462, 695
	Solanum sp.		515
	S. lycopersicum		4,63,126,540,694, 820
	" "	Fruit	7,24,108,190,354, 384,792
	". "	Unripe fruit	84, 85
	S. tuberosum	Tuber	130,190,309,429, 462,569,664,792
Sterculiaceae	Sterculia plantanifolia		8
	Theobroma cacao		24, 244, 458, 459, 460, 792
Theaceae			244, 298, 795
Umbelliferae			515
	Angelica archangelica	Root	698
	Anethum graveolens	Leaf	792
	Apium graveolens		24, 190
	Pastinaca sativa		792
	Petroselinum sativum		792
Valerianaceae	Valeriana officinalis		92
	Valerianella sp.		515

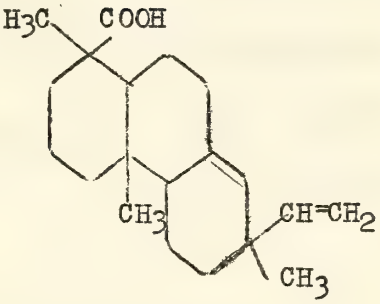
Family	Genus and Species	Source	Reference
Vitaceae	Ampelopsis sp.		515
	A. quinquefolia	Fruit	564
	Vitis vinifera	Fruit	24,188,190, 193,284
	" "		285, 286
	" "	Vines	489
	" "	Leaf, fruit	348
	" "	Leaf, shoot	487
	" "	Sap	488, 814
Zingiberaceae	Hedychium sp.	Leaf	221
Zygophyllaceae	Guaiacum sp.	Phloem	221

Phthalic Acid

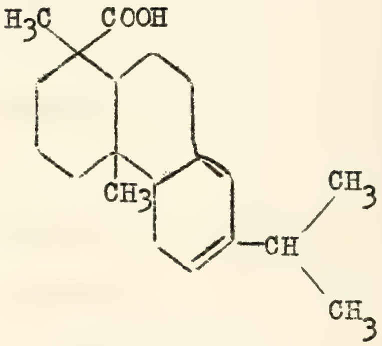


Family	Genus and Species	Source	Reference
Papaveraceae	Papaver somniferum		641

Pimaric Acid



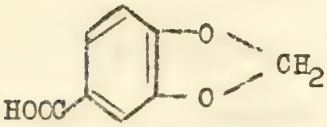
d-pimaric



levopimaric

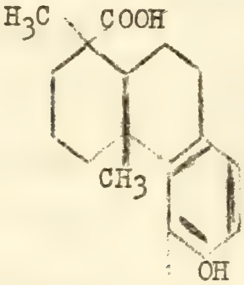
Family	Genus and Species	Source	Reference
Pinaceae	Picea vulgaris	Resin	67
	P. excelsa	Resin	265c,349a,349b
	Pinus 5 spp.	Oleoresin	265c
	P. maritima	Resin	161, 381
	P. palustris	Oleoresin	35a, 265a
	" "	Resin	360a
	" "	Turpentine gum	509a
	P. pinaster		163
	P. silvestris		265b, 280a

Piperonilic Acid



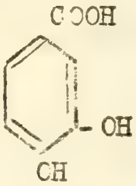
Family	Genus and Species	Source	Reference
Rubiaceae	Palicourea densiflora	bark	324

Podocarpic Acid



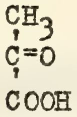
Pinaceae	Dacrydium cupressinum		165, 657
	Podocarpus cupressina		507, 657
	P. dacrydioides		165, 657

Protocatechuic Acid



Bignoniaceae	Crescentia sp.	Crude curare	336, 793
Globulariaceae	Globularia alypum		753
Liliaceae	Allium cepa	Skin	21, 393, 394, 772
Magnoliaceae	Illicium anisatum	Fruit, seed	505
	I. religiosum	Fruit	125, 168, 170
	I. verum	Capsule	77
Saxifragaceae	Hydrangea Thunbergii	Leaf	706
Vitaceae	Vitis vinifera	Leaf	74

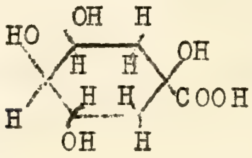
Pyruvic Acid



$$\begin{array}{c} CH_3 \\ | \\ C{=}O \\ | \\ COOH \end{array}$$

Family	Genus and Species	Source	Reference
Chenopodiaceae	Spinacia oleracea	Leaf	32
Euphorbiaceae	Ricinus communis	Germinating seed	149
Gramineae	Hordeum vulgare		57
	" "	Seedling	320
Labiatae	Mentha piperita	Leaf	717, 719
Leguminosae	Arachis hypogaea	Seedling	202, 203
	Pisum sativum	Leaf	32
	" "	Seedling	769
	" "		767
	Trifolium pratense		767
Liliaceae	Allium cepa		55
	" "	Juice	456
	Tulipa gesneriana		717, 718
Rosaceae	Pyrus malus	Fruit	303
Solanaceae	Solanum tuberosum	Tuber	38, 719
Umbelliferae	Daucus carota	Leaf, root	717
	" "	Root	719

Quinic Acid

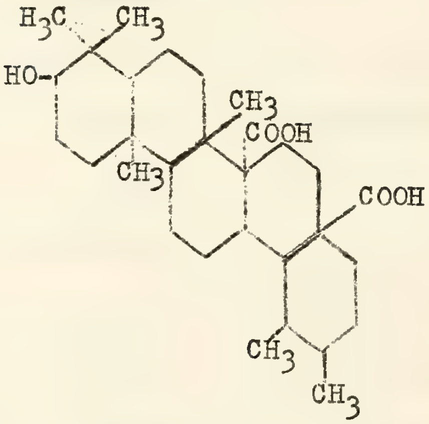


Compositae	Taraxacum officinale		408

Family	Genus and Species	Source	Reference
Ericaceae	Vaccinium arctostaphylos	Leaf	678
	V. myrtillus		331
	" "	Young leaf	346
	" "	Foliage	831
	V. oxycoccus	Fruit	355, 382
	V. vitis idaea	Leaf	334
Gramineae		Hay	407, 408
		Mixed herbage	305
Leguminosae	Tamarindus indica	Fruit	331
Magnoliaceae	Illicium verum	Capsule	77
Pinaceae	Cedrus Libani	Needle	709
	Larix europaea	Needle	709
	Picea excelsa	Young shoot	345
	" "		346
Ranunculaceae	Aconitum septentrionale		321
Rosaceae	Prunus domestica	Ripe fruit	151
	" "	Fruit	355
	P. persica	Fruit	19, 137
	Pyrus communis	Juice	598
	" "	Fruit	743
	P. malus	Fruit	301, 303
	" "	Juice	537, 538, 708
Rubiaceae	Cinchona sp.		293, 527, 528, 592, 751
	C. Cordifolia		528
	Coffea sp.	Fruit	833
	Gallium mollugo		498
Solanaceae	Nicotiana tabacum	Leaf	360

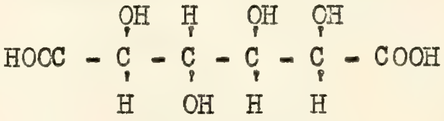
Family	Genus and Species	Source	Reference
Umbelliferae	Angelica archangelica	Root	698
Vitaceae	Vitis vinifera	Fruit	355

Quinovic Acid



Rosaceae	Potentilla	Root	595
Rubiaceae	Cinchona spp.		592
	C. sp.		620
Zygophyllaceae	Zygophyllum coccineum		677

Saccharic Acid



$$\mathrm{HOCC}-\underset{\mathrm{H}}{\overset{\mathrm{OH}}{\mathrm{C}}}-\underset{\mathrm{OH}}{\overset{\mathrm{H}}{\mathrm{C}}}-\underset{\mathrm{H}}{\overset{\mathrm{OH}}{\mathrm{C}}}-\underset{\mathrm{H}}{\overset{\mathrm{OH}}{\mathrm{C}}}-\mathrm{COOH}$$

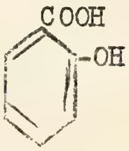
Moraceae	Ficus elastica	Latex	239

Saccharinic Acid

$CH_2OH\text{-}CHOH\text{-}CHOH\text{-}C(CH_3)(OH)\text{-}COOH$

Bromeliaceae	Ananas sativas	Fruit	80

Salicylic Acid

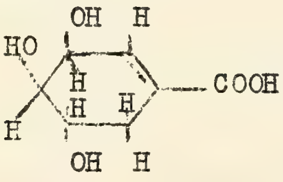


Compositae	Calendula officinalis		147

Family	Genus and Species	Source	Reference
Compositae	Matricaria chamomilla	Flower head	555
Euphorbiaceae	Cluytia similis	Stem, leaf	739
Iridaceae	Iris versicolor	Rhizome	561
Leguminosae	Daviesia latifolia	Leaf, stem	562
	Glycyrrhiza glabra	Root	146
	Trifolium pratense	Flower	560
Liliaceae	Aloe sp.		741
	Gloriosa superba	Tuber	127
	Hyacinthus sp.		249
	Tulipa sp.		249
	Yucca sp.		249
Moraceae	Morus sp.	Fruit	146
Pittosporaceae	Pittosporum undulatum	Fruit	563
Polygalaceae	Polygala sp.	Root	645
Ranunculaceae	Cimicifuga racemosa	Rhizome	195
Resedaceae	Reseda odorata		424
Rosaceae	Fragaria sp.	Calyx, pedicel	437
	" "	Fruit	550, 551, 720, 745
	" "	Fruit pulp and juice	697
	" "	Juice	801
	Prunus armenica	Fruit	720
	P. avium	Fruit	147
	P. cerasus	Fruit	147, 251, 720
	" "	Juice	317
	P. domestica	Fruit	720
	P. persica	Fruit	720
	Rubus fructicosus	Fruit	720

Family	Genus and Species	Source	Reference
Rosaceae	Rubus idaeus	Fruit	146, 251, 720, 745
	" "	Juice	271, 801
	R. occidentalis	Fruit	720
	Spiraea ulmaria	Flower	424, 425
Rubiaceae	Uragoga ipecacuanha	Root	424
Rutaceae	Barosma sp.		780
	Casimiroa edulis	Seed	556
Saxifragaceae	Ribes sp.	Fruit	720
Solanaceae	Solanum lycopersicum		201, 525
Violaceae	Viola 6 spp.		147
	V. syrtica	Leaf, stem, rhizome	426
	V. tricolor	Flower, leaf, stem, root	250
	" "	Leaf, stem, rhizome	426
Vitaceae	Vitis labrusca	Fruit	251
	V. vinifera	Fruit	437

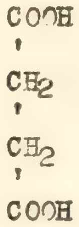
Shikimic Acid



Family	Genus and Species	Source	Reference
Ginkgoaceae	Ginkgo biloba	Leaf	266, 818
Gramineae	Lolium perenne		602
Magnoliaceae	Illicium anisatum		505
	I. religiosum	Fruit	125, 168
	" "		170
	" "	Carpel	663
	I. Verum		77, 220

Family	Genus and Species	Source	Reference
Magnoliaceae	Illicium verum	Carpel	663
Pinaceae	25 spp.		266
Taxaceae	4 spp.		266

Succinic Acid



$$\begin{array}{c} COOH \\ | \\ CH_2 \\ | \\ CH_2 \\ | \\ COOH \end{array}$$

Critical review of literature - Franzen & Ostertag (215)

Aceraceae	Acer saccharum	Sirup	476, 549
	" "	"Sugar sand"	477
Amaryllidaceae	Narcissus poeticus	Leaf, root	762
Begoniaceae	Begonia semperflorens		617, 742
Betulaceae	Corylus sp.	Nut	148
Bignoniaceae	Crescentia sp.		72
	" "	Crude curare	336
Bombacaceae	Adansonia digitata	Fruit	5
Celastraceae	Goupia tomentosa	Wood	160
Compositae	Artemisia absinthium		714
	" "	Leaf	829
	Helianthus annuus		58
	Lactuca sativa		350, 742
	L. virosa		350
	Taraxacum officinale		408
Chenopodiaceae	Beta vulgaris	Juice	400, 508, 680, 681
	" "	Top, root	578
	" "	Leaf, root	752
	Spinacia oleraceae	Leaf	381

Family	Genus and Species	Source	Reference
Compositae	Lactuca spp.		521
Crassulaceae	Bryophyllum sp.	Leaf	577, 578
	B. calycinum	Leaf	113, 570, 695
	" "	Detached leaf	748
	" "		694
	Echeveria secunda		214
	" "	Leaf	492
	Sedum acre	Leaf	492
	Sempervivum glaucum	Leaf	52
Cruciferae	Brassica oleraceae	Leaf, bud	482
	Bunias orientalis	Stem, leaf, flowering top	322
Ericaceae	Vaccinium myrtillus	Fruit	331
	" "	Whole plant	590
Euphorbiaceae	Ricinus communis		65, 149
Fagaceae	Fagus sylvatica	Sap	652
	Quercus sp.	Nut	148
Gramineae			305
	Avena sativa		297
	Bambusa sp.		71
	Dactylis glomerata		138
	Hordeum vulgare	Leaf	118, 695
	" "	Etiolated shoot	172
	" "	Seedling	297, 694
	" "		320, 749
	Lolium perenne		138
	Oryza spp.		819
	O. sativa		264

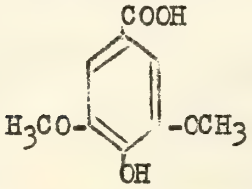
Family	Genus and Species	Source	Reference
Gramineae	Phleum pratense		138
	Saccharum officinarum	Juice	10,99,609,610,611 804,821
	Triticum sp.		749
	Zea mays	Leaf	43, 578
Juglandaceae	Juglans regia	Nut	148
Lauraceae	Persea gratissima	Kernel	520
Leguminosae	Lupinus albus	Seedling	297
	Phaseolus coccineus		58
	Pisum sativum	Seedling	297
	Tamarindus indica		209, 331
Loganiaceae	Strychnos toxifera		71, 73
Malvaceae	Gossypium sp.		185
Moraceae	Morus sp.		816
	M. alba	Bark exudate	233
	M. indica	Leaf	332
Musaceae	Musa basjoo	Juice	628
	M. sapientum	Fruit	200
Papaveraceae	Chelidonium majus		643
	Eschscholtzia sp.		776
	Glaucium luteum	Juice	640
	Papaver somniferum		776
Pinaceae		Turpentine	383
	Abies pectinata	Turpentine	117
	" "	Resin	733
	Agathis australis	Resin	464
	A. dammara	Resin	729

Family	Genus and Species	Source	Reference
Pinaceae	Larix decidua	Rosin	732
	Picea vulgaris	Resin	730
	Pinus sp.	Sap	652
	P. silvestris	Resin	731
Polygonaceae	Fagopyrum esculentum		148
	" "	Leaf and stem	578
	Rheum hydridum	Rhizome, stem	618
	" "	Leaf	695
	R. officinale	Petiole	106
	R. rhaponticum	Leaf, petiole	578
	R. Undulatum	Petiole	348
Proteaceae	Orites excelsa	Wood	672
Ranunculaceae	Anemone nemorosa	Leaf	404
	" "		742
Rosaceae	Fragaria sp.	Fruit	6
	Prunus avium	Fruit	204
	P. cerasus	Juice	325
	" "	Fruit	343
	P. communis	Fruit pulp	326
	P. persica	Fruit	19
	Pyrus aucuparia	Fruit	213
	" "		405
	P. communis	Juice	598
	" "	Fruit	743
	P. malus	Fruit	43, 109, 110
	" "		206
	" "	Juice	537, 710

Family	Genus and Species	Source	Reference
Rosaceae	Rubus fructicosus	Leaf	211
	" "	Fruit	473
	R. idaeus	Leaf	218, 325, 742
Rutaceae	Citrus limonum	Fruit	332
Santalaceae	Santalum album		315
Sapotaceae	Mimusops sp.		521
Saxifragaceae	Ribes rubrum		205
Scrophulariaceae	Digitalis purpurea		88, 337
Solanaceae	Atropa belladonna		369
	Nicotiana sp.		43, 578, 661, 694
	" "	Leaf	577, 758, 759
	N. tabacum	Leaf	695, 761
	Solanum lycopersicum	Fruit	7, 746, 747
	" "	Over-ripe fruit	83, 84, 85
	" "	Leaf, stalk	578
	" "	Leaf	694, 695
	S. tuberosum	Tuber	824
Umbelliferae	Angelica archangelica	Root	698
	Daucus carota	Root	109, 110, 413
Vitaceae	Vitis vinifera	Leaf	74
	" "	Unripe fruit	105
	" "	Fruit	106, 348

Family	Genus and Species	Source	Reference
Vitaceae	Vitis vinifera	Sap, fruit	286
	" "	Sap	489, 814

Syringic Acid



Family	Genus and Species	Source	Reference
Gramineae	Saccharum officinarum	Juice	611
	" "	Crude molasses	704

Tartaric Acid

$$\begin{array}{c} COOH \\ | \\ CHOH \\ | \\ CHOH \\ | \\ COOH \end{array}$$

Critical review of literature
Franzen & Helwert (208)

Family	Genus and Species	Source	Reference
Aceraceae	Acer saccharum	"Sugar sand"	402, 674
	" "	Sirup	477
Amaryllidaceae	Agave americana	Leaf sap	111
Anacardiaceae	Mangifera indica		87
	Rhus coriaria		156
	R. semialata		744
	Spondias purpurea		565
Araliaceae	Aralia hispida	Fruit	230
Ascelpiadaceae	Asclepias syriaca	Milky sap	649
Berberidaceae	Berberis integerrima	Fruit	348
	Caulophyllum thalictroides	Fruit pulp	687
Betulaceae	Betula alba	Sap	225
Bombacaceae	Adansonia sp.	Fruit pulp	270

Family	Genus and Species	Source	Reference
Bombacaceae	Adansonia sp.	Fruit	448
	A. digitata	Fruit	5
Bromeliaceae	Ananas sativas	Fruit	80, 521
Caprifoliaceae	Diervilla florida	Fruit	139
	Lonicera xylosteum	Fruit	174
	Sambucus calicarpa	Fruit	128
	S. ebulus	Fruit	178
	" "	Root	179
	S. nigra	Fruit	177
	Symphoricarpus racemosus	Fruit	671
	Viburnum lantana		182
	V. nudum		410
Caricaceae	Carica papaya	Fruit	519
Celastraceae	Celastrus obscurus	Leaf	158
	C. scandens	Fruit	786
	Euonymus atropurpureus	Root bark	471
	E. europaeus	Seed kernel	253
Chenopodiaceae	Beta vulgaris	Root	234, 400
	" "	Root, leaf	752
	Chenopodium ambrosioides		69
Commelinaceae	Tradescantia purpurea	Stem sap	227
	T. zebrina	Stem sap	227
Compositae	Bellis perennis		183
	Helianthus tuberosus	Tuber	93, 234
	Matricaria chamomilla	Flower	276

Family	Genus and Species	Source	Reference
Cornaceae	Cornus paniculatum	Fruit	656
	C. sericea	Fruit	687
Cruciferae	Capella bursa pastoris		135
Elaegnaceae	Hippophaë rhamnoides	Fruit	807
Elaeocarpaceae	Elaeocarpus serratus	Fruit	817
Ericaceae	Vaccinium sp.	Leaf	334
	V. corymbosum	Fruit	265
	V. vitis idaea	Leaf	499
	" " "	Fruit	802
Eucommiaceae	Eucommia ulmoides	Leaf	254
Euphorbiaceae	Euphorbia cyparissias	Milky sap	784
	E. platyphylla	Milky sap	785
	Phyllanthus emblica		332
	Ricinus communis		65
Fagaceae	Quercus pedunculata	Wood	445
Geraniaceae	Geranium zonale		94
Gramineae	Bambusa sp.	Shoot	626
	Saccharum officinarum	Juice	821
	Sorghum vulgare		419, 796, 797
Guttiferae	Garcinia gambogia	Fruit rind	370
Hydnoraceae	Prosopanche burmeisteri		826
Labiatae	Glechoma hederaceae		180
	Orthosiphon stamineus		344
Lauraceae	Persea gratissima	Fruit pulp	520, 521

Family	Genus and Species	Source	Reference
Leguminosae	Astragalus sp.	Twig	412
	Bauhinia reticulata	Fruit, leaf	585
	Cassia sp.	Leaf	726, 773
	C. acutifolia	Leaf	379
	Tamarindus indica	Fruit pulp	82, 596, 756
	" "		3, 199, 209, 241 634, 750
	" "	Leaf	245
	" "	Mesocarp	278
	" "	Green and ripe fruit	316, 565
	" "	Fruit	332, 701
Liliaceae	Clintonia borealis	Fruit	669
	Erythronium dens canis	Bulb	157
	Smilacina bifolia	Fruit	167
	S. racemosa	Fruit	167
Magnoliaceae	Schizandra chinensis	Fruit	531
Moraceae	Morus indica	Leaf	332
Myrtaceae	Eugenia australis		411
	Psidium guajava		625
Musaceae	Musa sapientum	Fruit	200
Orchidaceae	Vanilla planifolia	Fruit	387
Oxalidaceae	Oxalis corniculata	Leaf	245
Pinaceae	Pinus sylvestris	Pollen	366
Piperaceae	Piper nigrum		526
Papaveraceae	Adlumana cirrhosa	Root	639
	Chelidonium majus	Leaf	567

Family	Genus and Species	Source	Reference
Papaveraceae	Fumaria officinalis	Sap	444
	Papaver somniferum	Capsule	145
Polygonaceae	Polygonum reynoutria	Stem	705
Ranunculaceae	Aconitum napellus		594
Rosaceae	Crataegus sp.	Fruit	435
	Cydonia vulgaris	Fruit	123, 701, 723
	Eriobotrya japonica	Fruit	371
	Fragaria sp.		123, 465, 723
	Prunus armeniaca	Fruit	123, 495, 497, 701
	" "		723
	P. avium		123
	P. cerasus	Fruit	123, 465, 495, 496, 497, 723
	P. domestica	Fruit	495, 496, 497, 723
	P. persica	Fruit	496, 635
	P. spinosa		648
	Pyrus arbutifolia	Fruit	591
	P. aucuparia		390, 405
	P. malus	Fruit	495, 497
	" "	Juice	701
	Rubus sp.		136
	R. idaeus	Fruit	465
	" "	Fruit juice	123, 341
	" "	Sap	338
Rubiaceae	Coffea sp.		522
Rutaceae	Citrus decumana	Fruit	441
	Cusparia trifoliata		97

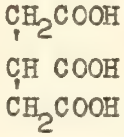
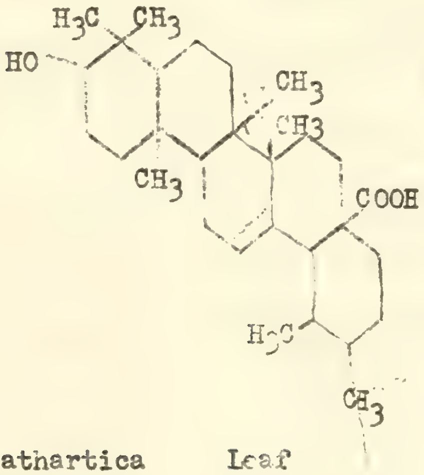
Family	Genus and Species	Source	Reference
Santalaceae	Leptomeria acida	Fruit	597
Sapindaceae	Sapindus saponaria		241
Sapotaceae	Achras sapota		523
	Bassia latifolia		349
	Sideroxylon crassipedicellatum	Fruit	523
Saxifragaceae	Ribes sp.		465
	R. grossularia		802
	R. nigrum		123
	R. rubrum		216, 802
Scrophulariaceae	Antirrhinum majus		775
	Digitalis grandiflora		775
	Euphrasia officinalis		176
	Linaria cymbalaria		775
	Scrophularia nodosa		775
	Veronica officinalis		175
Solanaceae	Cyphomandra calycina		524
	Physalis peruviana	Fruit	376
	Solanum dulcamara	Fruit	16, 786
	S. lycopersicum		4
	" "	Fruit	7, 181, 348, 701
	S. Tuberosum	Tuber	171
Sterculiaceae	Theobroma cacao	Berry	90

Family	Genus and Species	Source	Reference
Tiliaceae	Tilia vulgaris		275
Urticaceae	Parietaria officinalis		289
Vitaceae			193
	Ampelopsis hederacea		242
	A. "	Leaf	243
	Parthenocissus quinquefolia	Leaf	539
	Vitis sp.		12
	" "	Leaf	511
	V. hederaceae		808
	V. labrusca	Juice	416, 635
	V. "	Fruit	474
	V. sylvestris	Fruit	604
	V. vinifera		14, 64, 224, 286, 308, 488
	" "	Fruit	15, 197, 284, 332, 495, 548, 701
	" "	Leaf	74, 348, 533, 651
	" "	Juice	143, 222, 231, 263, 358, 534, 653
	" "	Sap	377, 810, 814
	" "	Vine	285
	" "	Unripe fruit	420, 503, 532
	" "	Young shoot, leaf	487

Tartronic Acid

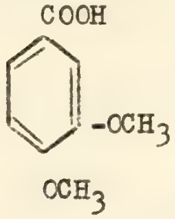
$$\begin{array}{c} COOH \\ | \\ CHOH \\ | \\ COOH \end{array}$$

Gramineae			603

Family	Genus and Species	Source	Reference
	Tricarballylic Acid		
	 CH_2COOH $CH\ COOH$ CH_2COOH		
Aceraceae	Acer saccharum	"Sugar sand"	402, 477
Chenopodiaceae	Beta vulgaris	Evaporated juice	395, 406
	" "	Root	396, 713
	" "	Juice	399
	" "	Root, leaf	752
Gramineae	Hordeum vulgare	Whole plant	483
	Ursolic Acid		
			
Apocynaceae	Allamanda cathartica	Leaf	27
Aquifoliaceae	Ilex aquifolium		196
	I. latifolia	Cuticle	335
	I. paraguariensis	Leaf	442
Cornaceae	Cornus florida	Flower, bract	624a
Ericaceae	Arctostaphylos uva-ursi	Leaf	623
	Enkianthus quinqueflorus		28
	Erica arborea		196
	E. carnea		196
	E. mediterranea		196

Family	Genus and Species	Source	Reference
Ericaceae	Kalmia angustifolia		319
	Leucothoe keiskei	Leaf	665
	Rhododendron 6 sp.		28
	R. pulchrum	Leaf	27
	R. simsii	Leaf	27
	Vaccinium macrocarpon-	Pomace	433
	V. myrtillus		196, 590
	V. oxycoccus	Fruit pulp	374
	V. vitis-idaea		196
Labiatae	Thymus vulgaris		615
	Salvia officinalis		101
Myrtaceae	Psidium guaijava	Leaf	26
Punicaceae	Punica granatum	Peel, leaf	102
Pyrolaceae	Pyrola minor		196
	P. umbellata		196
Rosaceae	Crataegus oxyacantha		59
	Eriobotrya japonica		27
	Prunus avium	Cuticle	433a
	P. serotina		258
	" "	Leaf	623
	Pyrus communis	Fruit skin	431
	P. malus	Fruit	260
	" "	Fruit skin	281, 623
	" "	Fruit cuticle	432
Solanaceae	Anthocercis intricata		22
	A. littorea		22
	A. odgersii		22
Verbenaceae	Verbena stricta		512

Veratric Acid



Family	Genus and Species	Source	Reference
Liliaceae	Sabadilla officinalis	Seed	443

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